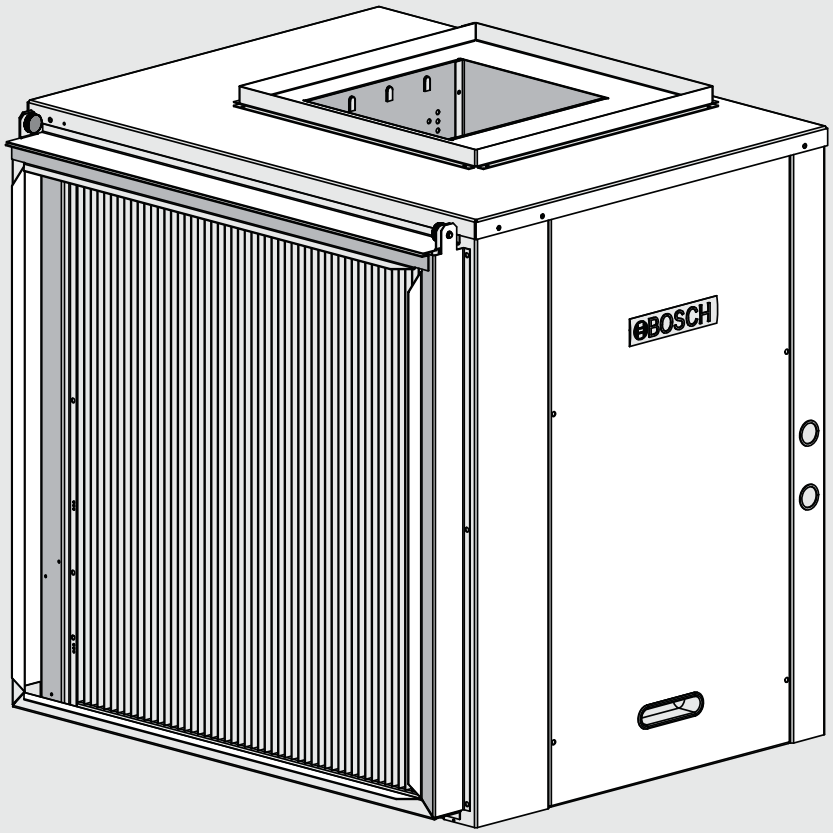


SM AH Series Heat pump

Greensource

SM024 | SM036 | SM048 | SM060 | SM070

BOSCH

Installation, Operation and Maintenance Manual

8733920084 (2013/11)

CONTENTS

Figure 1: CS/AH Pairings

UNIT MODEL	Paired Air Handler					
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
SM024-1CSC	SM024-1AVX	SM024-1AHX	DX025-1VTX	DX025-1CCX	DX025-1UCX	DX035-1VTX
SM036-1CSC	SM036-1AVX	SM036-1AHX	DX035-1VTX	DX035-1CCX	DX035-1UCX	DX049-1VTX
SM048-1CSC	SM048-1AVX	SM048-1AHX	DX049-1VTX	DX049-1CCX	DX049-1UCX	
SM060-1CSC	SM060-1AVX	SM060-1AHX	DX061-1VTX	DX061-1CCX	DX061-1UCX	DX071-1VTX
SM070-1CSC	SM070-1AVX	SM070-1AHX	DX071-1VTX	DX071-1CCX	DX071-1UCX	

LEGEND:

AVX BOSCH box style Vertical Air Handler
AHX BOSCH box style Horizontal Air Handler
CCX Cased coil
UCX Uncased coil
VTX Motex unitary style air handler

AH MODEL NOMENCLATURE

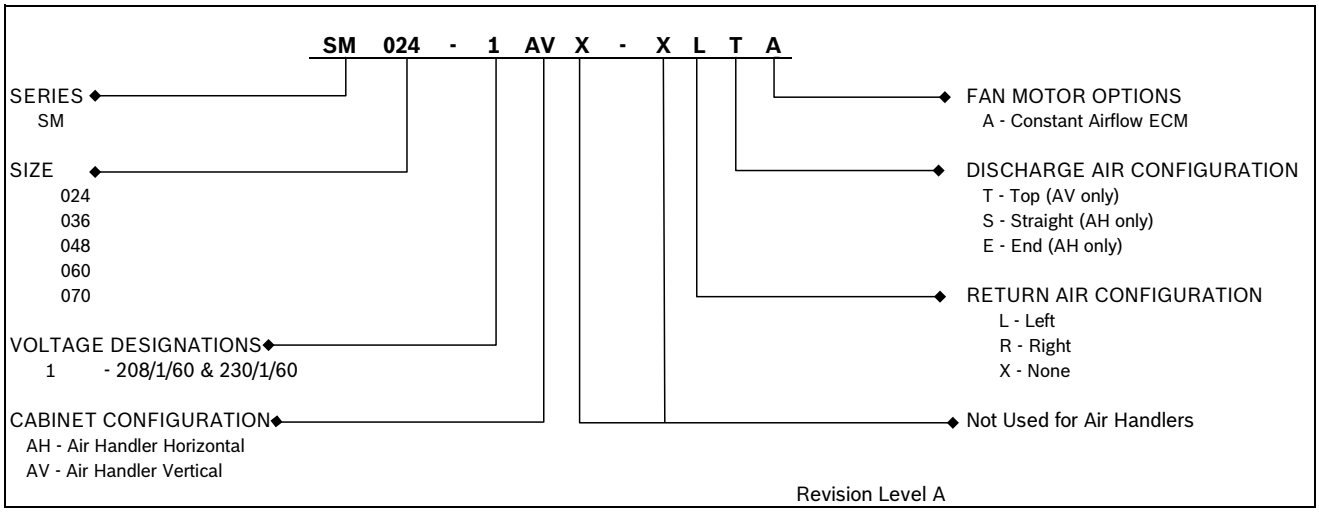


Figure # 2

KEY TO SYMBOLS

Warnings

Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of the warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **NOTE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in sever injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

Important Information

This symbol indicates important information where there is no risk to property or people.

SAFETY WARNINGS

Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment.

Before performing service or maintenance operations on the system, turn off main power to the unit. Electrical shock could cause personal injury or death.

When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.

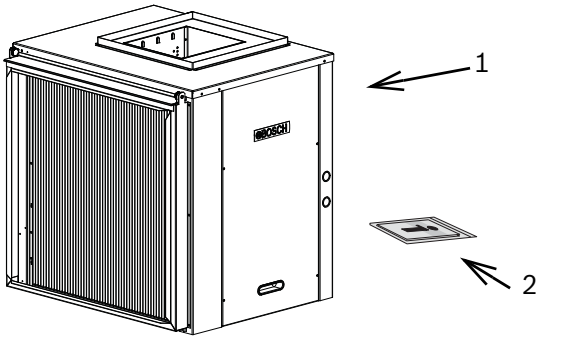
All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. Doing so may affect the unit's warranty. The mechanical components and filters will quickly become clogged with construction dirt and debris, which may cause system damage.

INITIAL INSPECTION

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 24 hours of receipt.

SM AH STANDARD PACKAGE



[1] SM Series Water-to-Air Heat Pump: Air Handler
[2] Installation and Operation Manual

GENERAL DESCRIPTION

These Split System Heat Pumps provide the best combination of performance and efficiency available. Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

The SM Split Water-to-Air Heat Pumps are Underwriters Laboratories (UL) and (cUL) listed for safety. All SM Water-to-Air Heat Pumps conform to UL1995 standard and are certified to CAN/CSA C22.1 No 236 by Intertek-ETL

MOVING AND STORAGE

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the "UP" arrows on each carton at all times. If unit stacking is required, stack units as follows: Vertical units no more than two high. Horizontal units no more than three high.

SAFETY CONSIDERATIONS

Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment. Untrained personnel can perform basic functions of maintenance such as cleaning coils and replacing filters.

When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.

The air handler blower should only be operated when a duct is installed and secured to heat pump duct collar in order to avoid possible injury.

LOCATION

To maximize system performance, efficiency and reliability, and to minimize installation costs, it is always best to keep the refrigerant lines as short as possible. Every effort should be made to locate the air handler and the condensing section as close as possible to each other.

Air Handler

Locate the air handler unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make electrical and duct connections. If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap.

The air handler units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned. Do not locate in areas that are subject to freezing.

Condensing Section

Locate the condensing section in an area that provides sufficient room to make water and electrical connections, and allows easy removal of the access panels, for service personnel to perform maintenance or repair.

Consult the condensing section of this manual for more information, or your CS factory's tech support.

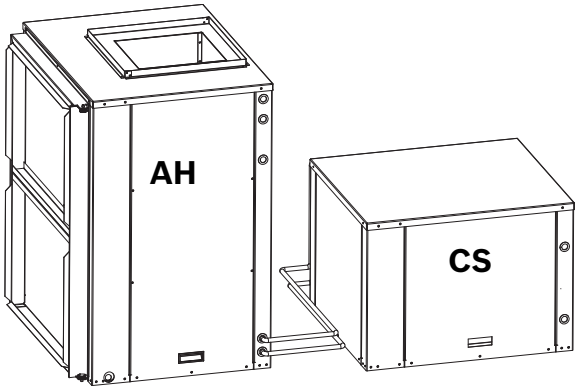


Figure # 3

INSTALLATION

Remove all shipping blocks under blower housing.

The installer should comply with all local codes and regulations which govern the installation of this type of equipment. Local codes and regulations take precedent over any recommendations contained in these instructions. In lieu of local codes, the equipment should be installed in accordance with the recommendations made by the National electric code, and in accordance with the recommendations made by the National Board of Fire Underwriters. All local seismic codes for seismic restraint of equipment, piping, and duct work shall be strictly adhered to.

Condensing Section

Locate the condensing section in an area that provides sufficient space to make water and electrical connections, allowing easy removal of the access panels. A 36" clearance in front of the unit is recommended. This will ensure proper work space for service personnel to perform maintenance or repair.

If the condensing section is installed in a location where ambient temperatures can fall below freezing, some form of freeze protection should be employed such as anti-freeze. Where the use of anti-freeze is not possible for example in a ground water application the fluid circulating pump should operate continuously to prevent possible condenser freeze-up and to optimize overall system performance. Consult the factory in these instances for guidance.

Water freezes at 32°F. Frozen water coils are not covered under the limited product warranty. It is the installer's responsibility to insure that the condensing section is installed in a location or has the proper controls to prevent rupturing the water coil due to freezing conditions.

Do not remove the protective caps or plugs from the service valves until the refrigerant lines are run and ready for final connection.

Mounting Vertical Air Handler Units

Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. (See Figure #4)

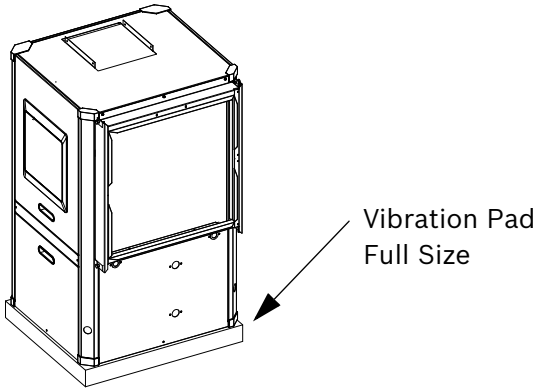


Figure # 4

Mounting Horizontal Air Handler Units

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kit. (See Figure #5). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details. All units require four mounting brackets at the corners. Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

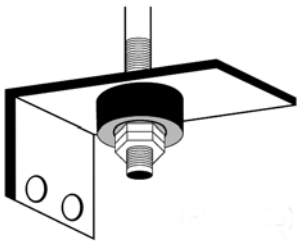


Figure # 5

Some applications require an attic floor installation of the horizontal air handler unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4" drain connected to this secondary pan should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4” above grade to prevent flooding of the electrical parts due to heavy rains.

CONDENSATE DRAIN

If equipped with float style condensate overflow switch, final adjustment must be made in the field.

Make sure that the unused drain pan opening is plugged prior to operating the air handler.

The air handler should be pitched approximately 1/4" towards the drain in both directions, to facilitate condensate removal. A drain line must be connected to the air handler and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit. This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow. (Units are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See Figure #6).

The length of the trap depends on the amount of positive or negative pressure on the drain pan. A second trap must not be included.

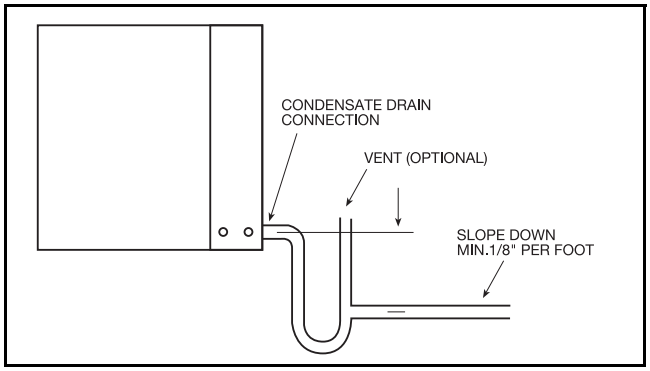


Figure # 6

The condensing unit should be pitched approximately 1/4" towards the drain in both directions, to facilitate condensate removal. (See Figure #6)

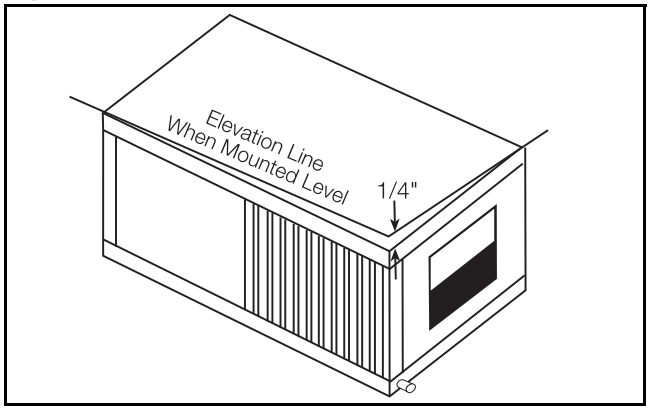


Figure # 7

DUCT SYSTEM

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to the FHP individual data specification sheet for physical dimensions of the collar and flange.

A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate forming during the cooling operation. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected.

Do not connect discharge ducts directly to the blower outlet. The factory provided air filter must be removed when using a filter back return air grill. The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation which includes new duct work, the installation should be designed using current ASHRAE procedures for duct sizing. If the unit is to be connected to existing ductwork, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application. If the duct system is too small, larger ductwork should be installed. Check for existing leaks and repair as necessary to ensure an air tight seal within the duct.

The duct system and all diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenums should be insulated. There should be no direct straight air path thru the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow. (Refer to ECM motor interface board section in this manual and Figure #8)

ELECTRICAL

Always disconnect power to the unit before servicing to prevent injury or death due to electrical shock or contact with moving parts.

All field wiring must comply with local and national fire, safety and electrical codes. Power to the unit must be within the operating voltage range indicated on the unit's nameplate.

Operating the unit with improper line voltage or with excessive phase imbalance is hazardous to the unit and constitutes abuse and is not covered under warranty.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See equipment rating plates for maximum size.

Both the air handler and condensing units are provided with a concentric knock-out in the front right corner post for attaching common trade sizes of conduit. Route power supply wiring through this opening. Flexible wiring and conduit should be used to isolate vibration and noise from the building structure. Be certain to connect the ground lead to the ground lug in each of the control boxes. Connect the power leads as indicated on the unit wiring diagrams.

Electric Heater Package Option

Factory installed internal electric heater packages are available for all units. Two circuit breakers are required when heater packages are utilized. The circuit breakers for the heater package provide power for the heater elements, the blower motor and the control circuit for the unit. The circuit breaker for the unit provides power for the compressor. This allows the electric heaters to continue to operate along with the blower motor in the case of unit compressor and/or compressor power supply failure. See HP Series Heater Kit Instructions for field installation. Each SM Series model has a number of heater sizes available. Refer to Figure #7 for heater package compatibility with specific SM Series units, models nomenclature and electrical data.

Low Voltage Control Wiring

The SM series units incorporate the ECM variable speed fan motor and control interface board. The thermostat should be connected to the air handlers and then from the air handler to the condensing section. The low voltage power supply is located in the air handler.

In this application utilize a 9 conductor cable from the thermostat to the air handler and 7 conductor cable from the air handler to the condensing section.

Each model has a number of heater sizes available. Refer to Figure #7 for heater package compatibility with specific units, model nomenclature and electrical data

Figure 8: Motor Profile Air Flow Table CFM - Two Stage Units

Model	Fan Only	Y1 COOL/ HEAT	Y2 COOL/ HEAT	AUX HEAT	EMERG HEAT	PLUS ADJ	MINUS ADJ	TAP COOL/ HEAT/DELAY
SM024	450	500	800	800	800	900	700	A
SM036	700	1050	1225	1225	1225	1400	1050	A
SM048	900	925	1500	1500	1500	1700	1275	B
SM060	1200	1500	2000	2000	2000	2300	1700	A
SM070	1600	1600	2200	2200	2200	2300	1900	A

Figure 9: Heater Package Compatibility

Model	Heater Model	KW	Heater Amps		Circuit	MCA		Max. Fuse		AWG Min.
			208V	240V		208V	240V	208V	240V	
SM024 thru 070	HP050-1XS	4.8	17.3	20.0	L1/L2	27.1	30.4	30	30	8
SM024 thru 070	HP100-1XS	9.6	34.7	40.0	L1/L2	48.8	55.4	50	60	6
SM036 thru 070	HP100-1XM	9.6	34.7	40.0	L1/L2	49.5	56.3	50	60	6
SM048 thru 070	HP150-1XM	14.4	52.0	60.0	SINGLE	71.2	81.3	80	90	4
	HP150-1XM	14.4	34.7	40.0	L1/L2	49.5	56.3	60	60	6
			17.3	20.0	L3/L4	21.7	25.0	25	25	10
SM048 thru 070	HP200-1XM	19.2	69.3	80.0	SINGLE	92.9	106.3	100	110	2
	HP200-1XM	19.2	34.7	40.0	L1/L2	49.5	56.3	50	60	6
			34.7	40.0	L3/L4	43.4	50.0	45	50	6

All heaters rated single phase 60 Hz, and include unit fan load. All fuses type “D” time delay or HACR type breaker or HRC FORM 1. Wire size based on 60 deg. C copper conductors.

Units supplied with internal electric heat require two (2) separate power supplies: one for the unit compressor and one for the electric heater elements, blower motor and control circuit. Refer to Figure #7 for wiring instructions, minimum circuit ampacities and maximum fuse/ breaker sizing.

Electronic Thermostat Installation

Position the thermostat subbase against the wall so that it is level and the thermostat wires protrude through the middle of the subbase. Mark the position of the subbase mounting holes and drill holes with a 3/16-inch bit. Install supplied anchors and secure base to the wall. Thermostat wire must be 8-conductor, 18-AWG wire. Strip the wires back 1/4-inch (longer strip lengths may cause shorts) and insert the thermostat wires into the connector as shown. Tighten the screws to ensure secure connections. The thermostat has the same type connectors, requiring the same wiring. See instructions in the thermostat for detailed installation and operation information.

When using a 2-cool, 3-heat thermostat both the W1 & W2 on the Heat Pump and W2 & EM on the thermostat must be connected together via a jumper. (See Figure#10)

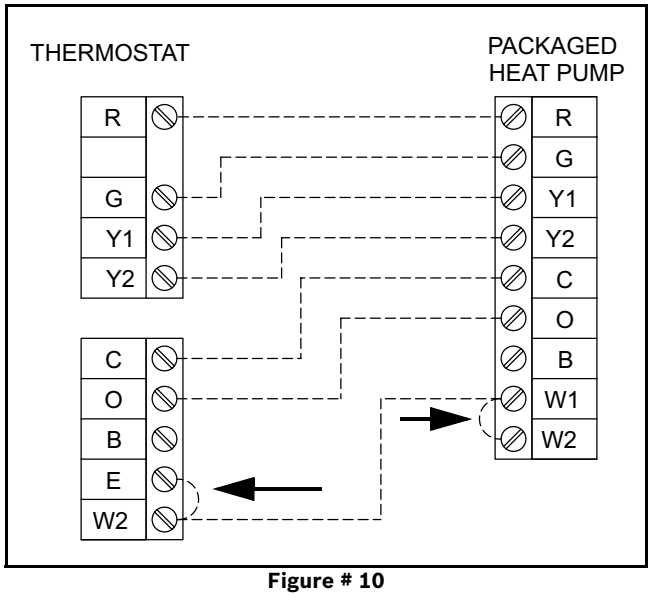


Figure # 10

Packaged heat pumps are equipped with detachable Thermostat connectors. These connectors are located in different locations based on the blower motor that is installed in the unit.

For the EON motor, the three detachable thermostat connectors are located on the ECM Interface board. See Wiring Harness Drawing on Pg#54.

Harness wiring can be loose, based on the options installed for the unit. See the Wiring Harness Drawing notes for further details.

Connection point logic is as follows:

Figure 11: Low Voltage Connection Points

Function	From Thermostat	To Air Handler	From Air Handler	To Condensing Section
24 HVAC Common	C	C	C	C
24 VAC Hot	R	R	R	R
Fan Operation	G	G		
Reversing Valve (3)	O	O	O	O
1st Stage Compressor Operation	Y1	Y1	Y1	Y1
2nd Stage Compressor Operation	Y2	Y2	Y2	Y2
Condensate Sensor (1)			CS	CS
Alarm Output (From UPM) (2)	L	Splice		ALR
Auxilliary Electric Heat (4)	W/W1/W2	W1		
Emergency Heat (4)	E	EM/W2		

1. For the condensate overflow sensor, connect 'CS' at the condensing section to 'CS' at the air handler. Be sure to ground power supply.
2. If service LED is utilized connect 'ALR' terminal on the UPM board to 'L' on the thermostat sub base. The wiring may be spliced in the air handling unit. The ALR output is always dry contact between the OUT and COM Terminals. See Thermostat connections section of this manual for additional information.
3. 'O' – reversing valve is energized in the cooling mode. Fail safe is to heating.
4. Utilized when electric strip heater package present.

ECM Interface Board

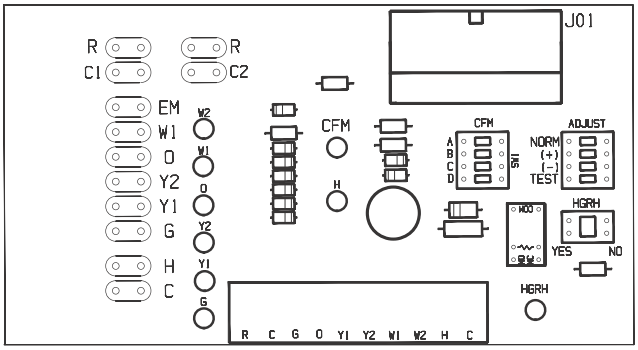


Figure # 12

THERMOSTAT CONNECTIONS

Thermostat wiring is connected to the 10 pin screw type terminal block on the lower center portion of the ECM Interface Board. In addition to providing a connecting point for thermostat wiring, the interface board also translates thermostat inputs into control commands for the variable speed programmable ECM DC fan motor and displays an LED indication of operating status.

The thermostat connections and their functions are as follows:

Y2	Second Stage Compressor Operation
Y1	First Stage Compressor Operation
G	Fan
O	Reversing Valve (energized in cooling)
W1	Auxiliary Electric Heat (runs in conjunction with compressor)
EM/W2	Emergency Heat (electric heat only)
NC	Transformer 24 VAC Common (extra connection)
C1	Transformer 24 VAC Common (primary connection)
R	Transformer 24 VAC Hot
HUM	Dehumidification Mode

If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit alarm output.

If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, a jumper between "R" and "COM" terminal of "ALR" contacts must be made.

If the thermostat is provided with a malfunction light powered off of the hot (R) side of the transformer, then the thermostat malfunction light connection should be connected directly to the (ALR) contact on the unit's UPM board.

To the left of the thermostat connection block are a row of 2 red and 4 green LED's. These LED's indicate the operating status of the unit. They are labeled as follows:

EM	RED	Emergency Heat On
W1	RED	Auxiliary Heat On
O	GREEN	Reversing Valve Energized, unit is in cooling mode
Y2	GREEN	Second Stage Compressor On
Y1	GREEN	First Stage Compressor On
G	GREEN	Fan On

Just above the connector block is a single red LED labeled CFM that will blink intermittently when the unit is running and may flicker when the unit is off. This LED indicates the air delivery of the blower at any given time. Each blink of the LED represent 100 CFM of air delivery so if the LED blinks 12 times, pauses, blinks 12 times, etc. the blower is delivering 1200 CFM. Refer to Figure #10 for factory programmed air delivery settings for the SM Series.

Just above and to the right of the thermostat connection block are four sets of jumper pins labeled ADJ, DELAY, HEAT and COOL. The ADJ set of pins are labeled NORM, (+), (-) and TEST. AP units will all be set on the NORM position from the factory, however, airflow can be increased (+) or decreased (-) by 15% from the pre-programmed setting by relocating the jumper in this section. The TEST position is used to verify proper motor operation. If a motor problem is suspected, move the ADJ jumper to the TEST position and energize G on the thermostat connection block. If the motor ramps up to 100% power, then the motor itself is functioning normally. Always remember to replace the jumper to NORM, (+) or (-) after testing and reset the unit thermostat to restore normal operation.

Do not set the ADJ jumper to the (-) setting when electric heaters are installed. Doing so may cause the heaters to cycle on their thermal overload switches, potentially shortening the life of the switches.

The other three sets of jumper pins are used to select the proper program in the ECM motor for the unit. Refer to Figure #7 for the proper jumper placement.

To the left of the red and green status LED's is a row of 1/4" male quick connects. These are used to pass thermostat inputs on to the rest of the control circuit. Remember to always turn off unit power at the circuit breaker before attaching or disconnecting any wiring from these connections to avoid accidental short circuits that can damage unit control components.

SEQUENCE OF OPERATION

Cooling Mode

See Typical Wiring Diagram at the end of the manual. Energizing the "O" terminal energizes the unit reversing valve in the cooling mode. The fan motor starts when the "G" terminal is energized.

When the thermostat calls for cooling (Y), the loop pump or solenoid valve if present is energized and compressor will start.

Once the thermostat is satisfied, the compressor shuts down accordingly and the fan ramps down to either fan only mode or off over a span of 30 seconds (ECM Motors).

Note that a fault condition initiating a lockout will de-energize the compressor.

Heating Mode

Heating operates in the same manner as cooling, but with the reversing valve de-energized. The compressor will run until the desired setpoint temperature on the thermostat is achieved.

Once the thermostat is satisfied, the compressor shuts down and the fan ramps down in either fan only mode or turns off over a span of 30 seconds. Auxiliary electric heating coils are not available on the EP product line.

REFRIGERANT LINES

The installation of the copper refrigerant tubing must be done with care to obtain reliable, trouble-free operation. This installation should only be performed by qualified refrigeration service and installation personnel.

Refrigerant lines generally can and should be routed and supported so as to prevent the transmission of vibrations into the building structure. Experience and good design practice dictate 75 feet as the maximum practical length for interconnecting refrigerant lines in split system heat pumps without special considerations. Beyond 75 feet, system losses become substantial and the total refrigerant charge required can compromise the reliability and design life of the equipment.

Refrigerant lines should be sized in accordance with Figure #13 in the following instructions. Copper tubing should be clean and free of moisture and dirt or debris. The suction and liquid lines MUST be insulated with at least 3/8" wall, closed-cell foam rubber insulation or the equivalent.

Some points to consider are:

- Pressure drop (friction losses) in refrigerant suction lines reduces system capacity and increases power consumption by as much as 2% or more, depending on the line length, number of bends, etc. Pressure drop in liquid lines affects system performance to a lesser degree, provided that a solid column of liquid (no flash gas) is being delivered to the refrigerant metering device, and that the liquid pressure at the refrigerant metering device is sufficient to produce the required refrigerant flow.

- Oil is continually being circulated with the refrigerant so, oil return to the compressor is always a consideration in line sizing. Suction lines on split system heat pumps are also hot gas lines in the heating mode, but are treated as suction lines for sizing purposes. If the recommended suction lines sizes are used, there should be no problem with oil return.
- Vertical lines should be kept to a minimum. Vertical liquid lines will have a vertical liquid lift in either heating or cooling, and the weight of the liquid head is added to the friction loss to arrive at the total line pressure drop.
- Wherever possible, the air handler should be installed at a higher elevation than the condensing section to aid with oil return to the compressor.

Linear vs Equivalent Line Length

Linear Line Length - is the actual measured length of the line including bends. This issued to calculate the additional refrigerant charge thatm ust be added to the system. (See Figure #15 and examples)

Equivalent Line Length - is the combination of the actual length of all the straight runs and the equivalent length of all bends valves and fittings in a particular line. The equivalent length of a bend, valve or fitting is equal to the length of a straight tube of the same diameter having the same pressure drop as the particular valve or fitting. The ASHRAE Fundamentals Handbook provides tables for determining the equivalent length of various bends, valves and fittings. Liquid and suction line sizes as shown in Figure #14 are based on Equivalent Line Length.

Connecting Refrigerant Lines

- Use only ACR grade copper tubing and keep ends sealed until joints are made.
- For best performance, select routing of refrigerant lines for minimum distance and fewest number of bends.
- Size lines in accordance with Figure #15.
- Cut crimped ends off the air handler suction and liquid lines. Connect and braze lines to the air handler.

The air handler is factory supplied with a holding charge of dry nitrogen.

- Connect and braze lines to service valves on the condensing section.

WARNING: Always wrap the body of the service valve with a wet towel or apply some other form of heatsink prior to brazing and direct flame away from the valve body. Failure to do so will result in damage to the valve. Valve bpdy temperature must remain below 250°F to protect the internal rubber “O” rings and seals.

Figure 13: Valve Sizing Chart

Unit Size	Line Type	Valve Conn. Size	Allen Wrench size
SM024/036	Suction	3/4	5/16
SM048/060/070	Suction	7/8	5/16
All Valves	Liquid	3/8	3/16

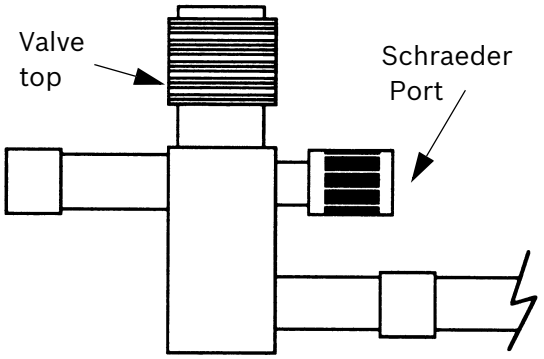


Figure # 14

Pressurize the refrigerant line set and air handler to 150lbs with dry nitrogen through the Schraeder ports provided on the self service valves. Check line set and unit connections for leaks.

Once system integrity is verified, evacuate line set and air handler with a good vacuum pump to 500 microns and hold for half hour.

Pump down must never be used with heat pumps.

CHARGING THE SYSTEM

Do not overcharge the system. Charge all systems by weight as determined from Figure #15 and the supplied factory charge. Remember the condensing unit is factory charged with sufficient refrigerant to support the air handler, condensing section and 25 feet of liquid line. If the lines are less orm ore than 25 feet, then a charge adjustment must be calculated. Refer to examples #1 and #2 in Figure #15..

DANGER: High pressure refrigerant gas and liquid is present in the unit. Liquid refrigerant can cause severe burns to exposed skin areas. Wear safety glasses to protect the eyese. Liquid refrigerant in contact with the eyes could cause loss of sight.

Open both service valves in the condensing section by turning the valve stops located at the top of each valve counter-clockwise with an Allen wrench. Make sure that both valves are fully open.

THINGS TO REMEMBER:

- Do not oversize liquid lines unless absolutely unavoidable. If oversized lines must be used, a suction line accumulator may be required and the addition of a crankcase heater may be necessary. Consult the Factory for recommendation.
- If the calculated Equivalent Line Length falls between the lengths shown on Table 3, use tubing sized for the next longer length.
- Maximum Linear (actual) liquid line length without a suction line accumulator is 60 feet. Liquid line length in excess of 100 feet is not recommended either with or without a suction line accumulator.
- A liquid line drier-filter is required, it must be of the bidirectional type only and approved for the refrigerant type utilized.
- Suction line size must be one of those given in Figure #15.
- Horizontal suction line runs should be pitched slightly toward the compressor to provide free drainage and aid oil return. Do not exceed the largest diameter given in the tables on horizontal runs.
- When brazing always bleed dry nitrogen through refrigerant tubing to displace air and prevent oxidation.
- Air handler is pre-charged in the factory with nitrogen gas. Cut air handler piping with care.

DANGER: Always check refrigerant type on the unit data plate before servicing. Do not use R-22 manifold gauges on R-410A units. Doing so could result in severe injury.

Figure 15: Refrigerant Charge, Line Sizing and Capacity Multiplier Chart

SYSTEM MODEL	Factory R410A Charge (Oz)*	Refrigerant Line O.D. Size (Based on Equivalent Line Length)										Suct. Line Riser Max.
		25 FT.		35 FT.		45 FT.		50 FT.		75 FT		
		LIQ.	SUC.	LIQ.	SUC.	LIQ.	SUC.	LIQ.	SUC.	LIQ.	SUC.	
SM024	80	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4	3/8	7/8	3/4
SM036	86	3/8	3/4	3/8	3/4	3/8	3/4	3/8	7/8	3/8	7/8	3/4
SM048	88	3/8	7/8	3/8	7/8	3/8	7/8	3/8	7/8	3/8	7/8	7/8
SM060	115	3/8	1-1/8	3/8	1-1/8	3/8	1-1/8	3/8	1-1/8	3/8	1-1/8	7/8
SM070	127	3/8	1-1/8	3/8	1-1/8	3/8	1-1/8	3/8	1-1/8	3/8	1-1/8	7/8
CAPACITY MULTIPLIER		1.00		.995		0.990		0.990		0.980		

Example 1:
Model SM036 with 45ft of equivalent length of 3/8” O.D Liquid Line. Total system charge= Factory charge + (45ft - 25 ft) x .60 oz/ft Total System Charge = 93 oz + (20ft x .60 oz/ft) = 105 oz. Additional 12 oz of R410A refrigerant required.

Example 2:
Model SM060 with 10ft of equivalent length of 3/8” O.D Liquid Line. Total system charge= Factory charge + (25ft - 10ft) x .60 oz/ft Total System Charge = 150 oz + (15ft x .60 oz/ft) = 141 oz. Additional 12 oz of R410A refrigerant required.

SYSTEM CHECKOUT

After completing the installation, and before energizing the unit, the following system checks should be made:

- Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
- Make sure that all electrical connections are tight and secure.
- Check the electrical fusing and wiring for the correct size.
- Verify that the low voltage wiring between the thermostat and the unit is correct.
- Verify that the water piping is complete and correct.
- Check that the water flow is correct, and adjust if necessary.
- Check the blower for free rotation, and that it is secured to the shaft.
- Verify that vibration isolation has been provided.
- Unit is serviceable. Be certain that all access panels are secured in place.

UNIT START-UP

1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to "COOL", and the fan switch to the "AUTO" position. The reversing valve solenoid should energize. The compressor and fan should not run.
3. Reduce the thermostat setting approximately 5 degrees below the room temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Turn the thermostat system switch to the "OFF" position. The unit should stop running and the reversing valve should deenergize.
6. Leave the unit off for approximately (5) minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting.Set the thermostat switch to "HEAT".
8. Increase the thermostat setting approximately 5 degrees above the room temperature.
9. Verify the heat pump is operating in the heating mode.
10. Set the thermostat to maintain the desired space temperature.
11. Check for vibrations, leaks, etc...

INITIAL START-UP

1. Make sure all valves in heat recovery water piping system are open. NEVER OPERATE HR PUMP DRY.
2. Turn on the heat pump. The HR pump should not run if the compressor is not running.
3. turn the HR switch to the “ON” position. The pump wil operate if entering water temperature to HR is below 120° F.
4. The temperature difference between the water entering and leaving the heat recovery should be 5° to 15° F.

MAINTENANCE

1. Filter changes or cleanings are required at regular intervals. The time period between filter changes will depend upon type of environment the equipment is used in. In a single family home, that is not under construction, changing or cleaning the filter every 60 days is sufficient. In other applications such as motels, where daily vacuuming produces a large amount of lint, filter changes may be need to be as frequent as biweekly.

WARNING: Equipment should never be used during construction due to likelihood of wall board dust accumulation in the air coil of the equipment which permanently affects the performance and may shorten the life of the equipment.

2. An annual “checkup” is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit’s data plate and the data taken at the original startup of the equipment.
3. Lubrication of the blower motor is not required, however may be performed on some motors to extend motor life. Use SAE-20 non-detergent electric motor oil.
4. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.

5. Periodic lockouts almost always are caused by air or water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur call a mechanic immediately and have them check for: water flow problems, water temperature problems, air flow problems or air temperature problems. Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

OPERATING PRESSURES & TEMPERATURES

Operating Temperatures and Pressures										
			COOLING				HEATING			
Model	Entering Water Temp. F	Water Flow	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure PSIG	Discharge Pressure PSIG	Water Temp Drop	Air Temp Rise °F
SM024 Part Load	30°	4					75-91	264-322	5-6	15-17
		8					79-96	270-331	3-4	16-18
	40°	4					88-107	277-339	6-7	17-20
		8	115-140	175-214	8-9	19-23	92-112	284-348	4-5	18-21
	50°	4	129-157	218-267	14-17	18-20	98-122	291-356	7-8	20-23
		8	124-151	204-250	8-9	19-22	110-130	298-364	5-6	21-24
	60°	4	134-163	249-305	13-16	17-20	112-136	304-372	8-10	22-26
		8	128-156	233-287	8-9	18-21	117-143	312-381	6-7	23-28
	70°	4	138-168	281-341	13-16	17-19	124-152	318-389	9-11	24-29
		8	133-161	263-323	7-9	18-21	131-159	325-398	6-8	26-31
	80°	4	143-174	317-388	13-16	16-19	136-166	331-405	11-13	27-32
		8	137-167	297-366	7-9	17-20	143-174	339-415	7-9	28-33
	90°	4	147-179	357-437	13-16	16-18	149-181	345-422	12-14	29-35
		8	141-172	335-411	7-9	17-20	156-190	352-432	8-10	31-37
	100°	4	151-185	402-492	13-15	15-18				
		8	146-177	378-459	7-9	16-19				
SM024 Full Load	30°	4					76-92	242-297	3-4	13-14
		8					80-97	249-304	2-3	13-15
	40°	4	125-151	180-221	14-18	19-22	89-108	255-312	4-5	15-17
		8	120-146	169-207	8-10	20-23	93-113	261-320	3-3	16-18
	50°	4	134-163	211-258	14-18	18-21	106-118	267-327	5-6	17-19
		8	129-157	198-242	8-10	19-23	110-126	274-335	3-4	18-21
	60°	4	139-169	241-295	14-17	18-21	113-138	280-342	6-7	19-22
		8	134-163	227-278	8-10	19-22	119-145	287-351	4-5	20-23
	70°	4	144-175	272-333	14-17	17-20	126-155	292-358	7-8	21-24
		8	138-168	255-313	8-10	18-21	133-162	300-367	5-6	22-26
	80°	4	148-181	307-375	14-17	17-19	138-168	305-373	8-9	23-27
		8	143-174	288-353	8-10	18-21	145-177	312-382	5-6	24-29
	90°	4	153-186	346-423	14-17	16-19	151-184	317-388	8-10	25-29
		8	147-179	325-398	8-9	17-20	158-193	325-398	6-7	26-31
	100°	4	158-191	389-477	13-16	16-18				
		8	152-185	366-448	8-9	17-20				

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80º d.b./67º w.b. entering air temperature in cooling, 70º d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50º assumes the use of antifreeze. As a result of continuing research and development, specifications are subject to change without notice.

Operating Temperatures and Pressures

			COOLING				HEATING			
SM036 Part Load	30°	4.5					73-89	266-325	5-6	15-18
		9.0					77-94	272-333	3-4	16-19
	40°	4.5	117-143	189-231	14-17	18-22	86-105	279-341	6-7	17-21
		9.0	112-137	178-217	8-9	19-24	90-110	286-350	4-5	18-22
	50°	4.5	126-154	221-270	14-17	18-21	105-125	293-358	7-8	20-24
		9.0	121-148	207-253	8-9	19-23	109-130	300-366	5-6	21-25
	60°	4.5	131-160	252-308	13-16	17-21	110-134	306-374	8-10	22-27
		9.0	125-153	237-290	8-9	18-22	115-141	314-383	6-7	23-29
	70°	4.5	135-165	284-347	13-16	17-20	122-150	320-391	9-11	24-30
		9.0	130-158	266-326	7-9	18-22	129-157	327-400	6-8	26-32
	80°	4.5	140-171	320-391	13-16	16-20	134-164	333-407	11-13	27-33
		9.0	134-164	300-367	7-9	17-21	141-172	341-417	7-9	28-35
	90°	4.5	144-176	360-440	13-16	16-19	147-179	347-424	12-14	29-36
		9.0	138-169	338-414	7-9	17-21	154-188	355-434	8-10	31-38
	100°	4.5	149-182	405-495	13-15	15-19				
		9.0	143-174	381-465	7-9	16-20				
SM036 Full Load	30°	4.5					74-90	244-299	3-4	13-15
		9.0					78-95	251-306	2-3	13-16
	40°	4.5	122-149	183-224	14-18	19-23	87-106	257-314	4-5	15-18
		9.0	117-143	172-210	8-10	20-24	91-111	263-322	3-3	16-19
	50°	4.5	131-160	214-261	14-18	18-22	95-105	269-329	5-6	17-20
		9.0	126-154	201-245	8-10	19-24	100-125	276-337	3-4	18-22
	60°	4.5	136-166	244-298	14-17	18-22	111-136	282-344	6-7	19-23
		9.0	131-160	230-281	8-10	19-23	117-143	289-353	4-5	20-24
	70°	4.5	141-172	275-336	14-17	17-21	124-152	294-360	7-8	21-25
		9.0	135-165	258-316	8-10	18-22	131-160	302-369	5-6	22-27
	80°	4.5	145-178	310-378	14-17	17-20	136-166	307-375	8-9	23-28
		9.0	140-171	291-356	8-10	18-22	143-175	314-384	5-6	24-30
	90°	4.5	150-183	349-426	14-17	16-20	149-182	319-390	8-10	25-30
		9.0	144-176	328-401	8-9	17-21	156-191	327-400	6-7	26-32
	100°	4.5	155-189	392-480	13-16	16-19				
		9.0	149-182	369-451	8-9	17-21				

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80º d.b./67º w.b. entering air temperature in cooling, 70º d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50º assumes the use of antifreeze. As a result of continuing research and development, specifications are subject to change without notice.

Operating Temperatures and Pressures

			COOLING				HEATING			
SM048 Part Load	30°	6.0					64-78	248-303	5-6	15-18
		12.0					67-82	254-311	3-4	16-19
	40°	6.0	109-134	183-224	18-22	19-23	75-91	261-319	6-8	17-21
		12.0	105-128	172-210	10-12	20-25	79-96	267-327	4-5	18-23
	50°	6.0	118-144	214-261	18-22	19-23	78-90	273-334	8-10	20-24
		12.0	113-138	201-245	10-12	20-24	82-95	280-342	5-7	21-26
	60°	6.0	122-149	244-298	17-21	18-22	96-117	286-349	9-11	22-27
		12.0	117-143	230-281	10-12	19-24	101-123	293-358	6-8	24-29
	70°	6.0	126-154	275-336	17-21	18-22	107-131	299-365	11-13	25-30
		12.0	121-148	258-316	10-12	19-23	113-138	306-374	7-9	26-32
	80°	6.0	130-159	310-378	17-21	17-21	117-143	311-380	12-15	27-33
		12.0	132-153	291-356	10-12	18-22	123-151	319-390	8-10	29-35
	90°	6.0	134-164	349-426	17-20	17-20	128-157	324-396	13-16	29-36
		12.0	129-158	328-401	9-12	18-22	135-165	332-406	9-11	31-38
	100°	6.0	139-170	392-480	16-20	16-20				
		12.0	133-163	369-451	9-11	17-21				
SM048 Full Load	30°	6.0					71-87	277-339	6-7	15-19
		12.0					75-92	284-347	4-5	16-20
	40°	6.0	118-144	194-237	21-25	19-23	84-102	291-356	7-9	18-22
		12.0	113-138	182-223	12-14	20-24	88-108	299-365	5-6	19-23
	50°	6.0	127-155	226-276	21-25	18-22	92-110	305-373	9-11	20-25
		12.0	122-149	213-260	12-14	19-24	98-120	313-383	6-7	21-26
	60°	6.0	131-160	259-316	21-25	18-22	108-132	320-391	10-13	23-28
		12.0	126-154	243-297	12-14	19-23	113-138	328-400	7-9	24-29
	70°	6.0	136-166	291-355	20-25	17-21	120-147	334-408	12-15	25-31
		12.0	130-159	273-334	12-14	18-22	126-154	342-418	8-10	27-32
	80°	6.0	140-171	328-401	20-24	17-20	131-161	348-425	14-17	27-34
		12.0	135-165	308-377	11-14	18-22	138-169	356-436	9-11	29-36
	90°	6.0	145-177	369-451	20-24	16-20	144-176	362-442	15-18	30-37
		12.0	139-170	347-424	11-14	17-21	151-185	371-453	10-12	32-39
	100°	6.0	149-183	415-508	19-24	16-19				
		12.0	143-175	391-477	11-14	17-21				

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80º d.b./67º w.b. entering air temperature in cooling, 70º d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50º assumes the use of antifreeze. As a result of continuing research and development, specifications are subject to change without notice.

Operating Temperatures and Pressures

			COOLING				HEATING			
SM060 Part Load	30°	7.0					68-84	256-313	5-7	19-23
		14.0					73-89	261-319	4-5	20-25
	40°	7.0	113-138	172-210	18-22	19-23	81-99	277-339	7-8	22-26
		14.0	110-134	161-196	12-14	20-24	86-105	283-346	5-6	23-28
	50°	7.0	116-142	206-252	17-21	19-23	93-114	299-365	8-9	24-29
		14.0	112-137	193-236	12-14	19-24	99-121	305-373	6-7	25-31
	60°	7.0	118-145	241-294	17-21	18-23	106-129	321-392	9-11	26-32
		14.0	115-140	225-275	11-14	19-23	113-138	327-400	7-8	28-34
	70°	7.0	121-148	275-336	17-21	18-22	118-145	342-418	10-12	29-35
		14.0	117-143	257-314	11-14	19-23	126-154	349-427	8-9	30-37
	80°	7.0	123-151	309-378	16-20	18-22	131-160	364-444	11-14	31-38
		14.0	120-146	289-353	11-13	19-23	139-170	371-454	8-10	33-40
	90°	7.0	126-154	344-420	16-20	18-22	143-175	385-471	12-15	33-41
		14.0	122-149	321-392	11-13	18-22	152-186	393-480	9-11	35-43
	100°	7.0	128-157	378-462	16-19	17-21				
		14.0	125-152	353-432	11-13	18-22				
SM060 Full Load	30°	7.0					68-84	256-313	5-7	19-23
		14.0					73-89	261-319	4-5	20-25
	40°	7.0	117-143	182-222	15-19	21-26	81-99	277-339	7-8	22-26
		14.0	114-139	170-208	11-14	22-27	86-105	283-346	5-6	23-28
	50°	7.0	120-147	215-263	15-18	20-25	93-114	299-365	8-9	24-29
		14.0	117-143	201-246	11-14	21-26	99-121	305-373	6-7	25-31
	60°	7.0	123-150	248-304	14-17	20-24	106-129	321-392	9-11	26-32
		14.0	119-146	232-284	11-13	21-25	113-138	327-400	7-8	28-34
	70°	7.0	126-154	282-344	14-17	19-24	118-145	342-418	10-12	29-35
		14.0	122-149	263-322	10-13	20-25	126-154	349-427	8-9	30-37
	80°	7.0	129-157	315-385	13-16	19-23	131-160	364-444	11-14	31-38
		14.0	125-153	294-360	10-12	19-24	139-170	371-454	8-10	33-40
	90°	7.0	132-161	348-426	13-16	18-22	143-175	385-471	12-15	33-41
		14.0	128-156	326-398	10-12	19-23	152-186	393-480	9-11	35-43
	100°	7.0	134-164	382-466	12-15	17-21				
		14.0	131-160	357-436	9-11	18-22				

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80º d.b./67º w.b. entering air temperature in cooling, 70º d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50º assumes the use of antifreeze. As a result of continuing research and development, specifications are subject to change without notice.

Operating Temperatures and Pressures

			COOLING				HEATING			
SM070 Part Load	30°	9.0					71-87	259-316	5-7	19-23
		18.0					76-92	264-322	4-5	20-25
	40°	9.0	116-141	175-213	18-22	19-23	84-102	280-342	7-8	22-26
		18.0	113-137	164-199	12-14	20-24	89-108	286-349	5-6	23-28
	50°	9.0	119-145	209-255	17-21	19-23	96-117	302-368	8-9	24-29
		18.0	115-140	196-239	12-14	19-24	102-124	308-376	6-7	25-31
	60°	9.0	121-148	244-297	17-21	18-23	109-132	324-395	9-11	26-32
		18.0	118-143	228-278	11-14	19-23	116-141	330-403	7-8	28-34
	70°	9.0	124-151	278-339	17-21	18-22	121-148	345-421	10-12	29-35
		18.0	120-146	260-317	11-14	19-23	129-157	352-430	8-9	30-37
	80°	9.0	126-154	312-381	16-20	18-22	134-163	367-447	11-14	31-38
		18.0	123-149	292-356	11-13	19-23	142-173	374-457	8-10	33-40
	90°	9.0	129-157	347-423	16-20	18-22	146-178	388-474	12-15	33-41
		18.0	125-152	324-395	11-13	18-22	155-189	396-483	9-11	35-43
	100°	9.0	131-160	381-465	16-19	17-21				
		18.0	128-155	356-435	11-13	18-22				
SM070 Full Load	30°	9.0					71-87	259-316	5-7	19-23
		18.0					76-92	264-322	4-5	20-25
	40°	9.0	120-146	185-225	15-19	21-26	84-102	280-342	7-8	22-26
		18.0	117-142	173-211	11-14	22-27	89-108	286-349	5-6	23-28
	50°	9.0	123-150	218-266	15-18	20-25	96-117	302-368	8-9	24-29
		18.0	120-146	204-249	11-14	21-26	102-124	308-376	6-7	25-31
	60°	9.0	126-153	251-307	14-17	20-24	109-132	324-395	9-11	26-32
		18.0	122-149	235-287	11-13	21-25	116-141	330-403	7-8	28-34
	70°	9.0	129-157	285-347	14-17	19-24	121-148	345-421	10-12	29-35
		18.0	125-152	266-325	10-13	20-25	129-157	352-430	8-9	30-37
	80°	9.0	132-160	318-388	13-16	19-23	134-163	367-447	11-14	31-38
		18.0	128-156	297-363	10-12	19-24	142-173	374-457	8-10	33-40
	90°	9.0	135-164	351-429	13-16	18-22	146-178	388-474	12-15	33-41
		18.0	131-159	329-401	10-12	19-23	155-189	396-483	9-11	35-43
	100°	9.0	137-167	385-469	12-15	17-21				
		18.0	134-163	360-439	9-11	18-22				

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80º d.b./67º w.b. entering air temperature in cooling, 70º d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50º assumes the use of antifreeze. As a result of continuing research and development, specifications are subject to change without notice.

UNIT CHECKOUT SHEET

Customer Data

Customer Name _____ Date _____
Address _____
_____
Phone _____ Unit Number _____

Unit Nameplate Data

Unit Make _____
Model Number _____ Serial Number _____
Refrigerant Charge (oz) _____
Compressor: RLA _____ LRA _____
Blower Motor: FLA (or NPA) _____ HP _____
Maximum Fuse Size (Amps) _____
Maximum Circuit Ampacity _____

Operating Conditions

	Cooling Mode	Heating Mode
Entering / Leaving Air Temp	_____ / _____	_____ / _____
Entering Air Measured at:	_____	_____
Leaving Air Measured at:	_____	_____
Entering / Leaving Fluid Temp	_____ / _____	_____ / _____
Fluid Flow (gpm)	_____	_____
Compressor Volts / Amps	_____ / _____	_____ / _____
Blower Motor Volts / Amps	_____ / _____	_____ / _____
Source Fluid Type	_____	_____
Fluid Flow (gpm)*	_____	_____
Fluid Side Pressure Drop*	_____	_____
Suction / Discharge Pressure (psig)*	_____ / _____	_____ / _____
Suction / Discharge Temp*	_____ / _____	_____ / _____
Suction Superheat*	_____	_____
Entering TXV / Cap Tube Temp*	_____	_____
Liquid Subcooling*	_____	_____

* Required for Troubleshooting ONLY

Auxiliary Heat

Unit Make _____
Model Number: _____ Serial Number _____
Max Fuse Size (Amps) _____
Volts / Amps _____
Entering Air Temperature _____
Leaving Air Temperature _____

MAIL TO: Bosch.Fhp.TechSupport@us.bosch.com
or scan the QR code and attach picture of this form with the information requested.

Bosch Group
601 NW 65th Court
Fort Lauderdale, FL 33309
Phone: (866) 642-3198
Fax: (800) 776-5529

TROUBLESHOOTING

Unit Troubleshooting		
Problem	**Possible Cause**	**Checks and Correction**
ENTIRE UNIT DOES NOT RUN	Power Supply Off	Apply power, close disconnect
	Blown Fuse	Replace fuse or reset circuit breaker. Check for correct fuses
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
	Thermostat	Set the fan to "ON", the fan should run. Set thermostat to "COOL" and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to "HEAT" and the highest temperature setting, the unit should run in the heating mode. If neither the blower or compressor run in all three cases, the thermostat could be miswired or faulty.To ensure miswired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between "R" and "C", "Y" and "C", and "O" and "C". If the blower does not operate, verify 24 volts between terminals "G" and "C" in the air handler. Replace the thermostat if defective.
UNIT OFF ON HIGH PRESSURE CONTROL	Discharge pressure too high	In “COOLING” mode: Lack of or inadequate water flow. Entering water temperature is too warm. Scaled or plugged condenser. In “HEATING” mode: Lack of or inadequate air flow. Blower inoperative, clogged filter or restrictions in duct work
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factor recommended charge.
	High pressure	Check for defective or improperly calibrated high pressure switch.
UNIT OFF ON LOW PRESSURE CONTROL	Suction pressure too low	In “COOLING” mode: Lack of or inadequate air flow. Entering air temperature is too cold. Blower inoperative, clogged filter or restrictions in duct work. In “HEATING” mode: Lack of or inadequate water flow. Entering water temperature is too cold. Scaled or plugged condenser.
	Refrigerant charge	The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.
	Low pressure switch	Check for defective or improperly calibrated low pressure switch.
UNIT SHORT CYCLES	Unit oversized	Recalculate heating and or cooling loads.
	Thermostat	Thermostat installed near a supply air grill; relocate thermostat. Readjust heat anticipator.
	Wiring and controls	Check for defective or improperly calibrated low pressure switch.

Unit Troubleshooting		
Problem	**Possible Cause**	**Checks and Correction**
INSUFFICIENT COOLING OR HEATING	Unit undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem
	Loss of conditioned air by leakage	Check for leaks in duct work or introduction of ambient air through doors or windows
	Airflow	Lack of adequate air flow or improper distribution of air. Replace dirty filter
	Refrigerant charge	Low on refrigerant charge causing inefficient operation
	Compressor	Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge of suction side of compressor. Replace reversing valve
	Operating pressures	Compare unit operation pressures to the pressure/temperature chart for the unit.
	TXV	Check TXV for possible restriction or defect. Replace if necessary.
	Moisture, noncondensables	The refrigerant system may be contaminated with moisture or noncondensables. Reclaim refrigerant, replace filter dryer, evacuate the refrigerant system, and recharge with factory recommended charge.
BLOWER OPERATES BUT COMPRESSOR DOES NOT	Thermostat	Check setting, calibration, and wiring.
	Wiring	Check for loose or broken wires at compressor, capacitor, or contactor.
	Safety Controls	Check UPM board red default L.E.D. for Blink Code
	Compressor overload open	If the compressor is cool and the overload will not reset, replace compressor.
	Compressor motor grounded	Internal winding grounded to the compressor shell. Replace compressor. If compressor burnout, install suction filter dryer.
	Compressor windings open	After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor.

WIRING DIAGRAMS

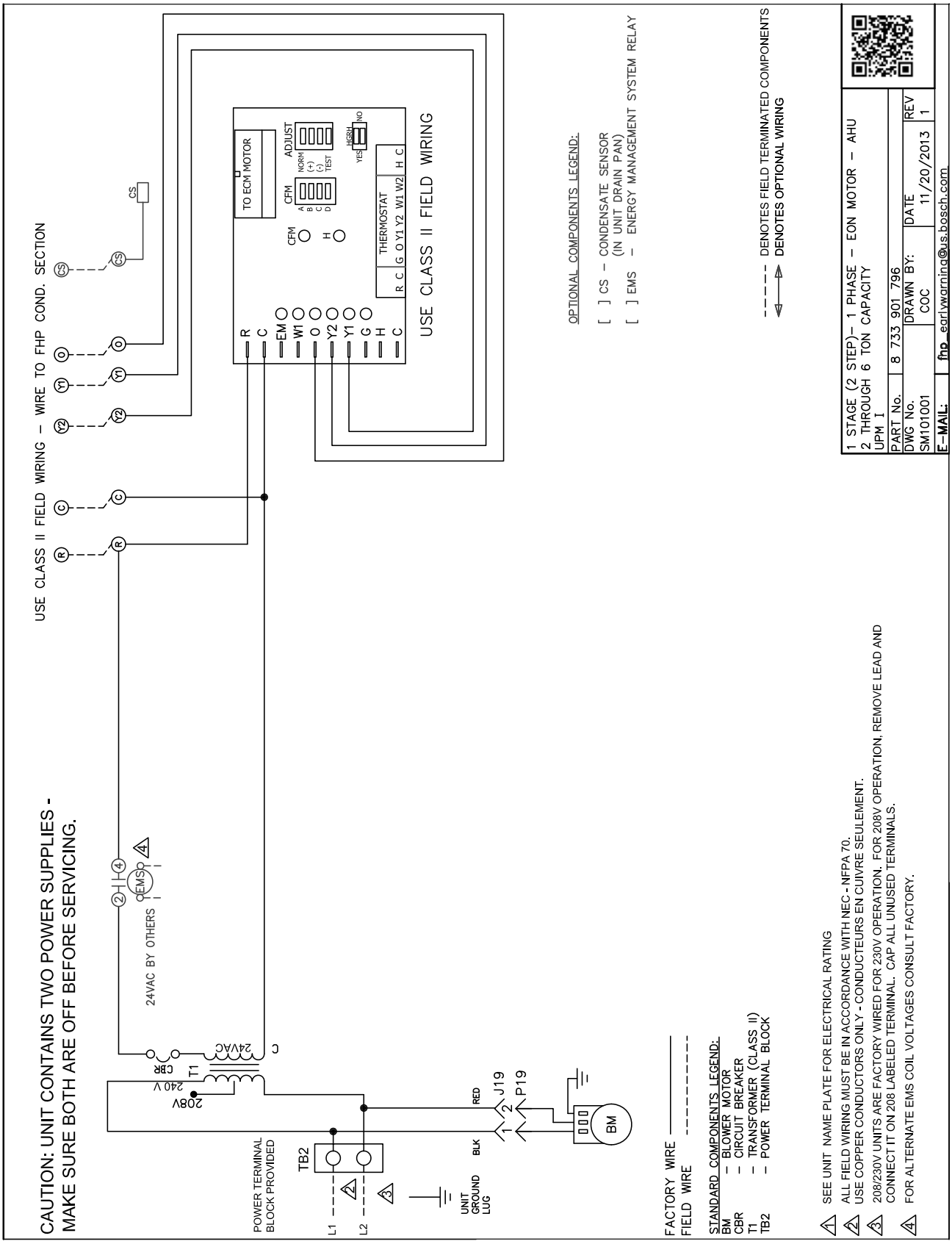


Figure # 16 SM - No Electric Heat Kit

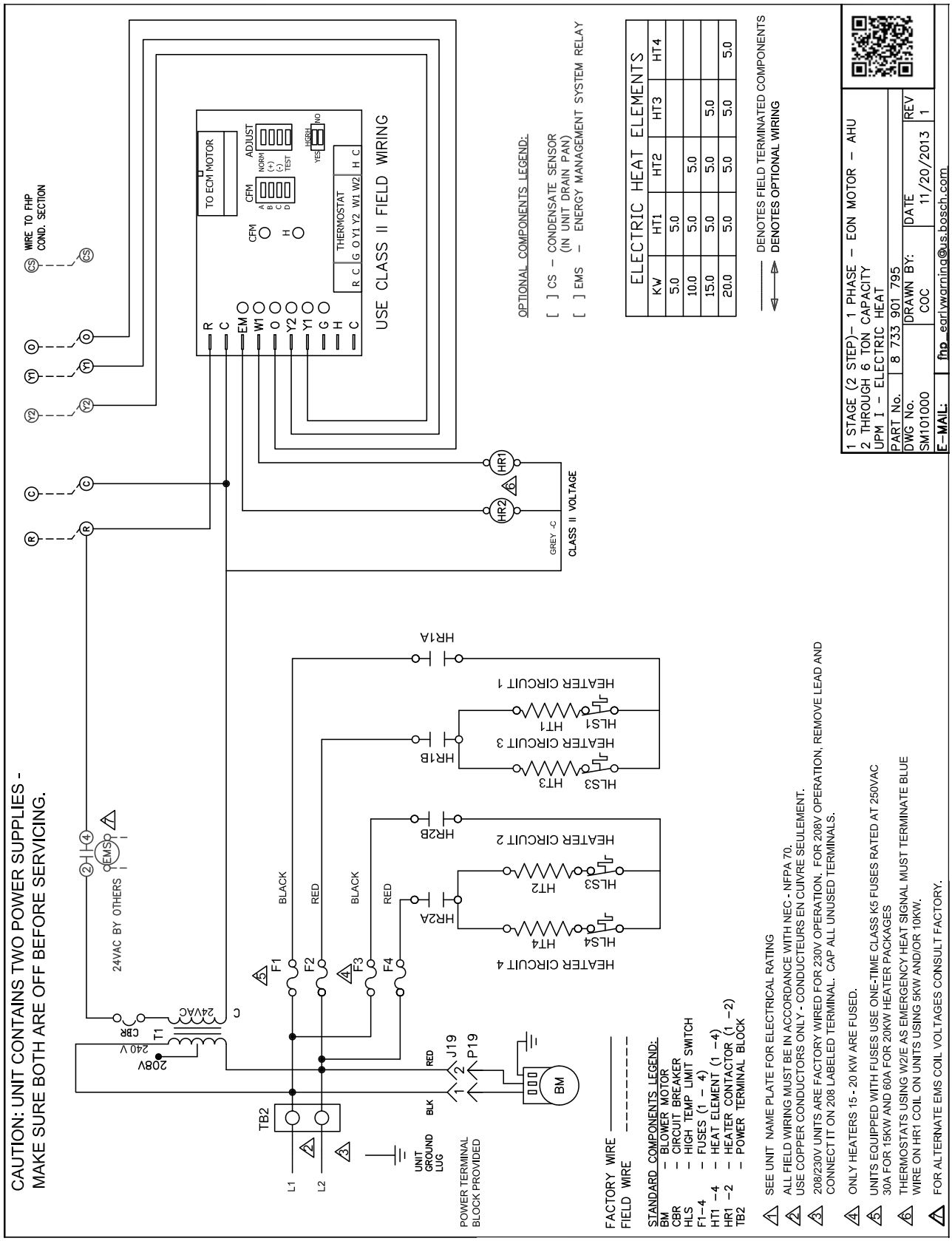
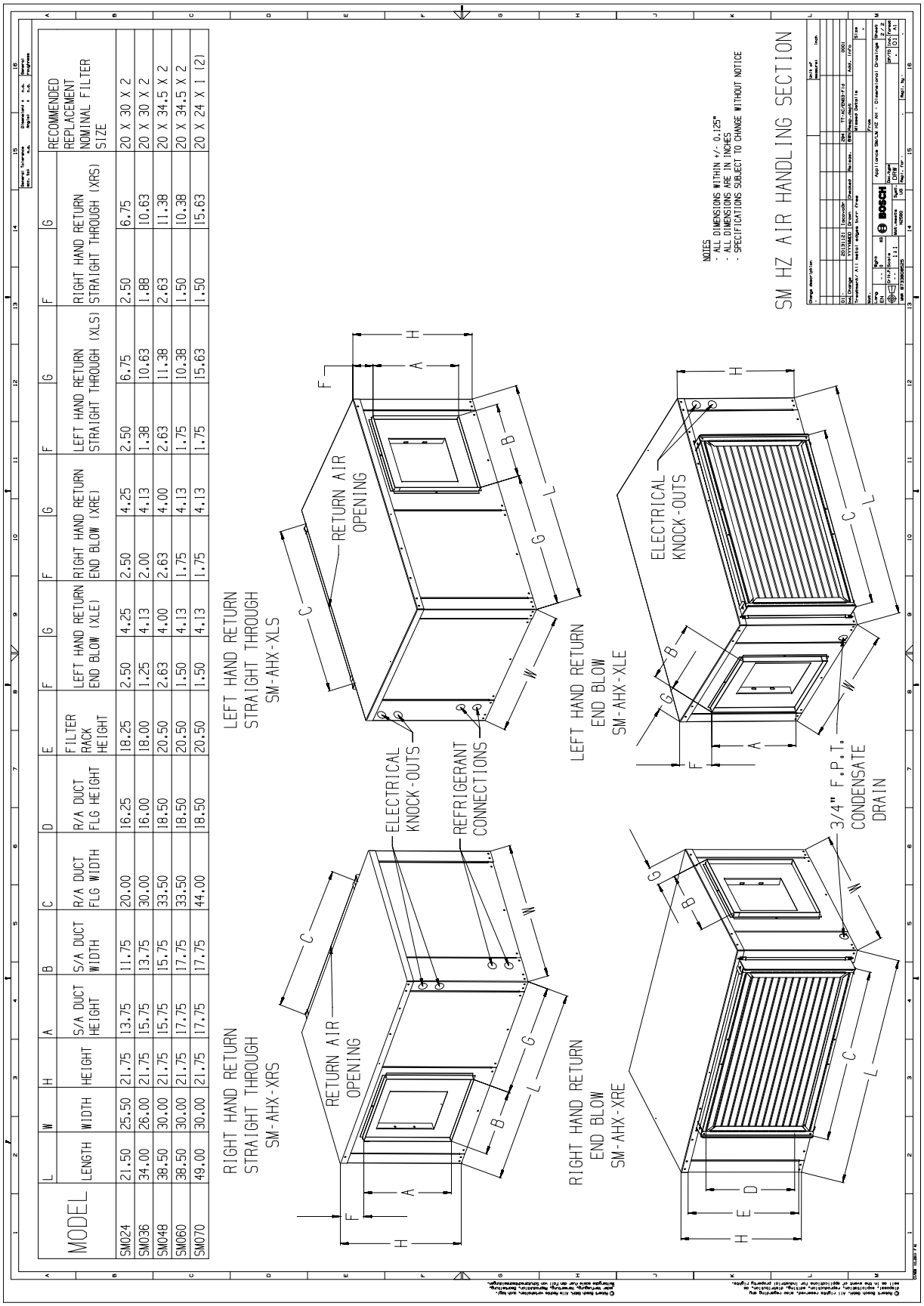


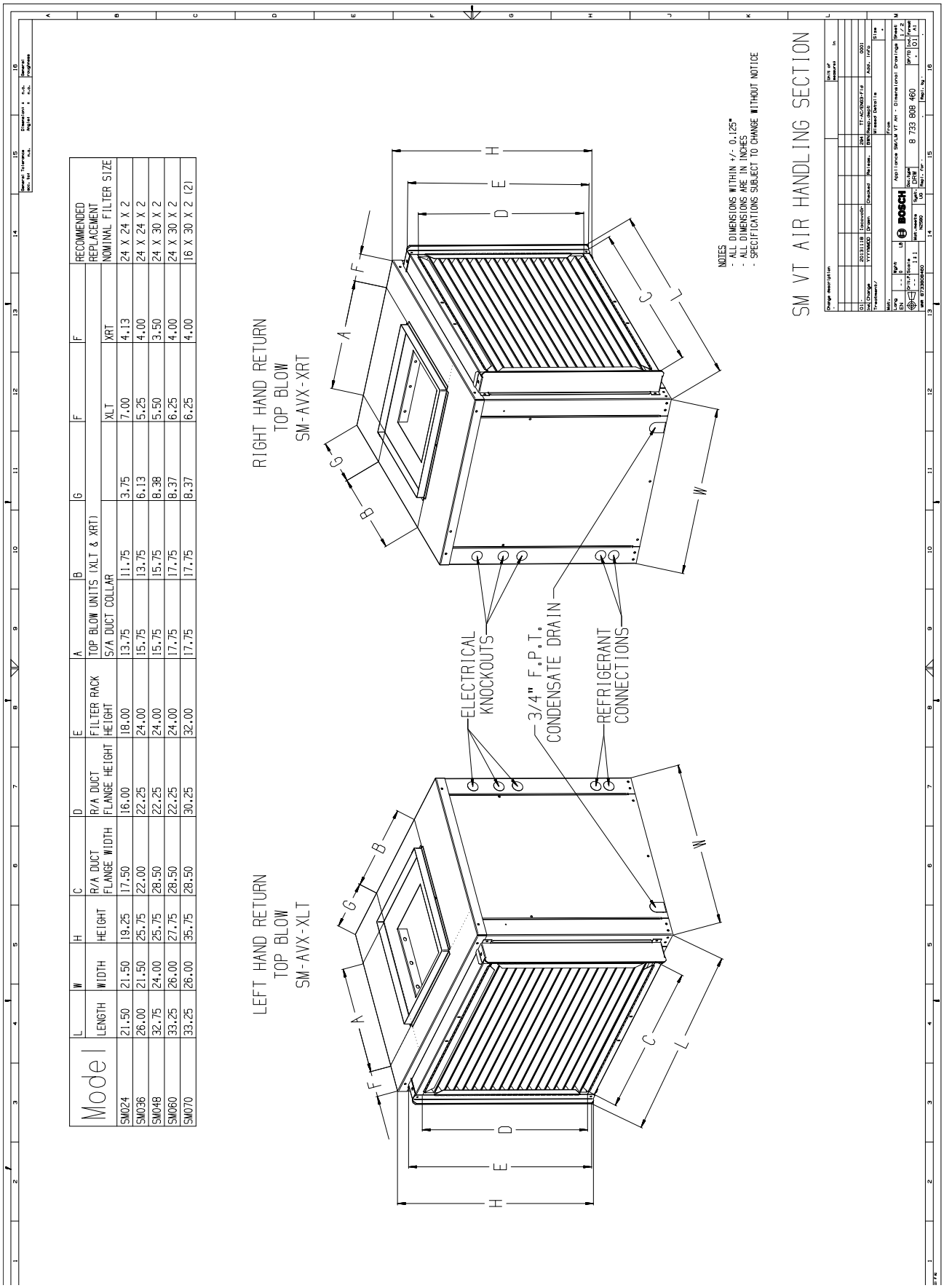
Figure # 17 SM- With Electric Heat Kit

DIMENSIONAL DRAWINGS

MODEL	L	W	H	A	B	C	D	E	F	G	F	G	RECOMMENDED REPLACEMENT NOMINAL FILTER SIZE
	LENGTH	WIDTH	HEIGHT	S/A DUCT HEIGHT	S/A DUCT WIDTH	R/A DUCT FLG WIDTH	R/A DUCT FLG HEIGHT	FILTER RACK HEIGHT	LEFT HAND RETURN END BLOW (XLE)	RIGHT HAND RETURN END BLOW (XRE)	LEFT HAND RETURN STRAIGHT THROUGH (XLS)	RIGHT HAND RETURN STRAIGHT THROUGH (XRS)	
SM024	21.50	25.50	21.75	13.75	11.75	20.00	16.25	18.25	2.50	4.25	2.50	6.75	2.50	6.75	20 X 30 X 2
SM036	34.00	26.00	21.75	15.75	13.75	30.00	16.00	18.00	1.25	4.13	1.38	10.63	1.88	10.63	20 X 30 X 2
SM048	38.50	30.00	21.75	15.75	15.75	33.50	18.50	20.50	2.63	4.00	2.63	11.38	2.63	11.38	20 X 34.5 X 2
SM060	38.50	30.00	21.75	17.75	17.75	33.50	18.50	20.50	1.50	4.13	1.75	10.38	1.50	10.38	20 X 34.5 X 2
SM070	49.00	30.00	21.75	17.75	17.75	44.00	18.50	20.50	1.50	4.13	1.75	15.63	1.50	15.63	20 X 24 X 1 (2)



Model	L	W	H	C	D	E	A	B	G	F	F	RECOMMENDED REPLACEMENT
	LENGTH	WIDTH	HEIGHT	R/A DUCT FLANGE WIDTH	R/A DUCT FLANGE HEIGHT	FILTER RACK HEIGHT	TOP BLOW UNITS (XLT & XRT) S/A DUCT COLLAR			XLT	XRT	NOMINAL FILTER SIZE
SM024	21.50	21.50	19.25	17.50	16.00	18.00	13.75	11.75	3.75	7.00	4.13	24 X 24 X 2
SM036	26.00	21.50	25.75	22.00	22.25	24.00	15.75	13.75	6.13	5.25	4.00	24 X 24 X 2
SM048	32.75	24.00	25.75	28.50	22.25	24.00	15.75	15.75	8.38	5.50	3.50	24 X 30 X 2
SM060	33.25	26.00	27.75	28.50	22.25	24.00	17.75	17.75	8.37	6.25	4.00	24 X 30 X 2
SM070	33.25	26.00	35.75	28.50	30.25	32.00	17.75	17.75	8.37	6.25	4.00	16 X 30 X 2 (2)



NOTES

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